The correlation between body mass index and menstrual cycle disorders in medical students of Udayana University

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ABSTRACT

Background: One relevant indicator in describing women's reproductive health and quality of life is the menstrual cycle. A high or low body mass index (BMI) can be a risk factor for menstrual disorders including irregular menstrual cycles, absence of menstruation and menstrual pain.

Aim: This study aims to determine the correlation between body mass index and menstrual cycle disorders in medical faculty students of Udayana University.

Method: This study used observational analytic study design and cross sectional approach. Samples are selected using purposive sampling technique. The samples were students in Medical Faculty of Udayana University with 90 amount of respondents aged 19-22 years old.

Result: Based on chi square statistical test, the results obtained with p value= 0,000 (p value <0,05).

Conclusion: The conclusion is there is a significant correlation between body mass index and menstrual cycle disorders in medical faculty students of Udayana University.

Keywords: Correlation, Body Mass Index, Menstrual Cycle Disorders, Students

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INTRODUCTION

Physiological changes in a woman's body can be called menstruation. Menstruation is influenced by reproductive hormones and occurs regularly.[1] Menstrual cycles that occur periodically or regularly every month can indicate a woman's reproductive organs are functioning optimally, while a disturbance in the menstrual cycle can indicate changes in ovarian function and may describe an increased risk of diseases such as ovarian cancer, fractures, diabetes, breast cancer, and cardiovascular disease.[2]

68% of women in Indonesia with an age range of 10–59 years experience menstrual irregularities and 13.7% experience irregularities in the menstrual cycle during the past 1 year.[3] Irregular menstrual cycles, disruption of menstrual pain or dysmenorrhea, disruption of menstrual volume both duration and duration bleeding and abnormal bleeding, and premenstrual syndrome are menstrual disorders that often occur in a woman.[4]

Menstrual disorders can be caused by abnormalities biologically and psychologically. Examples of biological disorders are reproductive system dysfunction, and psychological disorders are states of stress and emotional disturbances. Menstrual disorders are influenced by body weight, frequency of exercise, physical activity, stress, diet, environmental exposure, working conditions, synchronization of menstrual processes, and endocrine disorders.[5]

The percentage of fat in the human body can be predicted one of them using the Body Mass Index (BMI). Fat is one of the compounds in the body that has an influence in the production of androgens and estrogens, where one of the dominant factors causing menstrual disorders is the hormone estrogen.[6] Estrogen levels that continue to increase indirectly can cause androgen hormones to increase. An increase in the androgen hormone level can interfere with follicular development so that follicular maturation cannot occur.[7] A limited mass of fat in the body can also cause levels of the androgen hormone to be aromatized into the hormone estrogen to decrease, thereby causing irregular menstrual cycles. Previous research conducted in Bantul in women of childbearing age, found 27.1% of women with underweight nutritional status, 17.5% of women with normal nutritional status, and 51.4% of overweight women experienced irregular menstrual cycles.8 High or low BMI can be a risk factor for menstrual disorders such as irregular menstrual cycles, no menstruation and menstrual pain.[6]

METHOD

The design of this study was observational analytic with cross-sectional approach. This research was conducted at the Faculty of Medicine of Udayana University. The study began from February to

March 2020.

The sample in this study amounted to 90 people. The target population in this study were female students at Udayana University. Affordable population in this study were female students at the Faculty of Medicine of Udayana University 2016-2017. Sampling was carried out using purposive sampling technique by finding samples that met the inclusion and exclusion criteria of the researcher until the required number of samples were met.

The inclusion criteria of this study were women aged between 19-25 years, not doing an increase or weight loss program, not doing high-intensity physical activity, and were not under severe stress. The exclusion criterion for this study is if the sample is not willing to fill out informed consent and is not willing to fill out a questionnaire. The procedure of this study was that the research subjects filled out informed consent as a sign of agreement to be the subject of the study, followed by measurement of BMI by measuring height and weight as well as filling out a menstrual cycle disorder questionnaire. Data analysis in this study used computer software using univariate descriptive tests and chi-square statistical tests.

RESULT

The characteristics of the research subjects can be seen in Table 1. The range of research subjects is 19-22 years and is dominated by the age of 20 years amounting to 41 (45.6%) people. From the distribution based on the class, it is known that of the 90 subjects studied, most were 2017 classed as many as 63 (70%) people. Based on the BMI distribution, it can be seen that the majority of research subjects have a normal BMI category of 54 (60%) people. From the distribution of menstrual cycle disorders, only 36 (40%) subjects experienced menstrual cycle disorders. It appears that most of the female students at the medical faculty of Udayana University did not experience menstrual cycle disorders. From the distribution of types of menstrual cycle disorders, it can be seen that the most common type of menstrual cycle disorders in the study subjects were oligomenorrhea or disruption of menstrual cycle extension for more than 35 days, with a total of 21 (58.3%) people. The most frequent disruption of the menstrual cycle after oligomenorrhea is a type of polimenore, where the menstrual cycle occurs less than 21 days. Polimenore is known to be experienced by 14 (38.9%) people.

Table 2 shows the majority of research subjects with menstrual cycle disorders polimenore type are in the category of underweight BMI as many as 10 people. In the overweight BMI category, the majority of subjects experienced oligomenorrhea type menstrual cycle disorders of 8 people, and 1 person experienced an amenorrhea type disorder. Subjects who did not experience menstrual cycle disorders were dominated by subjects in the normal BMI category as many as 49 people.

Table 3 presents the information that in the normal BMI category, 90.7% of study subjects did not experience menstrual cycle disorders. Subjects with menstrual cycle disorders were dominated by subjects in the underweight BMI category with a percentage of 89.5% people, followed by subjects from the overweight BMI category of 84.6%.

Based on the results of the chi-square test at 95% confidence level ($\alpha \leq 0.05$), the results obtained p value = 0,000, where the results of p value <0.05, so that H0 is rejected and Ha is accepted, which means there is a relationship between BMI and disorders menstrual cycle in Udayana University Faculty of Medicine students.

DISCUSSION

Irregular menstrual cycles can be caused by various factors, one of the factors that play a role is nutritional status, which can affect estrogen

Tabel 1.   Characteristics of Research Subjects

Variables	Frecuency (n)	Percentage (%)
Age		
19	1	1,1
20	41	45,6
21	37	41,1
22	11	12,2
Year of Entry		
2016	27	30
2017	63	70
BMI		
Underweight	19	21,1
Normal	54	60
Overweight	13	14,4
Obesitas	4	4,4
Menstrual Cycle		
Disorder	36	40
No Disorder	54	60
Type of Disorder		
Oligomenore	21	58,3
Polimenore	14	38,9
Amenore	1	2,8

Tabel 2. Cross Tabulation between Age, Year of Entry, BMI and Type of Menstrual Cycle Disorders

Variables	Menstrual Cycle Disorders							
	Oligomenore		Polimenore		Amenore		No Disorder	
	n	%	n	%	n	%	n	%
Age								
19	0	0,0	0	0,0	0	0,0	1	100
20	10	24,4	9	22	0	0,0	22	53,7
21	7	18,9	2	5,4	1	2,7	27	73
22	4	36,4	3	27,3	0	0,0	4	36,4
Year								
2016	6	22,2	4	14,8	1	3,7	16	59,3
2017	15	23,8	10	15,9	0	0,0	38	60,3
BMI								
Underweight	7	36,8	10	52,6	0	0	2	10,5
Normal	3	5,6	2	3,7	0	0	49	90,7
Overweight	8	61,5	2	15,4	1	7,7	2	15,4
Obesitas	3	75	0	0	0	0	1	25

Tabel 3. Bivariate Analysis of BMI and Menstrual Cycle Disorders

BMI Category	Menstrual Cycle Disorders				Total		P Value
	Disorder		No Disorder				
	N	%	n	%	n	%	
Underweight	17	89,5	2	10,5	19	100	
Normal	5	9,3	49	90,7	54	100	0,000
Overweight	11	84,6	2	15,4	13	100	
Obesitas	3	75	1	25	4	100	

production and regular menstrual cycle. Estrogen plays an important role in the menstrual process.[9]

Most research subjects are dominated by subjects aged 20 years. The reproductive period starts from the age of 20 to 40 years. During the reproductive period, the menstrual cycle will generally run regularly and only slightly changes.[10] Based on the characteristics of the force year it is known that research subjects are dominated by female students of 2017. The characteristics of the research subjects based on BMI indicate that the majority of research subjects have a normal BMI category. Normal BMI will describe the optimal fulfillment of nutrients. Optimal nutrition can help spur the development of the sexual organs, while nutrition that is not fulfilled results in inhibition of sexual maturation and growth.[11]

The majority of research subjects undergo regular menstrual cycles. The results of this study are comparable to the 2016 study in Pebrina, where only 30.6% of the study sample experienced menstrual cycle disorders, while the remaining 69.4% had regular menstrual cycles.[9] Irregular menstrual cycles can have a serious impact on health short-term or long-term in women who cause symptoms that affect metabolism, sex, sleep, fertility, reproductive function and so on.[12]

Characteristics of research subjects based on the type of menstrual disorders show the most common type of menstrual disorders experienced in this study is oligomenore which is an extension of the menstrual cycle that occurs longer than the normal cycle, which is >35 days. The most frequent menstrual cycle disorders experienced in this study after oligomenorrhea are polimenore type disorders, polimenore type disorders are menstrual cycle disorders that occur faster than the normal cycle, which is <21 days. The most influential factor in regularity of the menstrual cycle is hormonal imbalance. There are many factors that can cause disruption of the balance in hormones, including stress levels, lifestyle, illness and weight.[13]

The majority of subjects with the category of underweight BMI had disruption of the menstrual cycle type polimenore. This is in accordance with the 2016 Astuti study, where 60% of Muhammadiyah 1 Junior High School Yogyakarta students who had an underweight BMI experienced a disruption of the type of menstrual cycle polimenore.[4] Adolescents who had a BMI of less than 17.5 kg / m2 had a risk of 2.06 experiencing a cycle irregular menstruation.[14]

The majority of research subjects with a normal BMI category experience regular menstrual cycles, this is similar to the 2018 Kumalasari study in Surabaya, which proves that there is a relationship between BMI with regular menstrual cycles, where subjects with a normal category BMI tend to experience regular menstrual cycles.[15]

Most subjects with the category of overweight and obese BMI experienced oligomenorrhea menstrual cycle disorders. This is consistent with Rakhmawati's 2013 study which found that the nutritional status of obesity in women would increase the risk of menstrual cycle disorders 1.89 times greater than that of normal nutritional status women.[7]

Regular menstrual cycles are dominated by respondents with a normal BMI category with a percentage of 90.7%. Subjects with menstrual cycle disorders were generally dominated by underweight BMI with a percentage of 89.5%, followed by 84.6% overweight BMI respondents. Statistically it can be said that there is a relationship between BMI and menstrual cycle disorders in Udayana University medical school students, with a p value = 0,000 (p value <0.05). This result is relevant to Jena's 2017 study in Bhubaneswar Odisha India, which states the results of a cross-

sectional study of menstrual patterns and BMI in high school teenage girls showed significant results with p value = 0.001 (p value <0.05) so that the hypothesis H0 is rejected and Ha is accepted, which means there is a significant relationship between BMI with menstrual cycle length.[16] Likewise, the 2018 Trisnawati study using 82 samples of YLPP Purwokerto midwifery academy students, which obtained the results of the chi-square test p value = 0,000 <0.05 so that there is a relationship between BMI with regular menstrual cycles.[17] Similar to this study, the Simbolon study in 2018 in Lampung that examined 170 female students of the University of Lampung medical faculty also found that there was a relationship between BMI and menstrual cycle length, evidenced by the results p value = 0.014 (p value <0.05).[6]

BMI is known to have an impact on the menstrual cycle through the role of estrogen hormones produced in the placenta, ovaries, adrenal glands and fat tissue.[6] Low levels of body fat will cause a decrease in estrogen levels, which is associated with infertility. Excess body fat levels cause an increase in estrogen levels which will cause an extension of the menstrual cycle.[18]

Irregular menstrual cycles in women whose weight is below normal can be caused by a little body fat due to lack of hormone synthesis and body fat reserves. A small amount of body fat will result in reduced androgen levels which will be aromatized into estrogen, which can cause irregular menstrual cycles.[6] Weight loss can cause a decrease in the hormone gonadotropin for the secretion of Leutenizing Hormone (LH) and Follicle Stimulating Hormone (FSH) which causes estrogen levels to decreased so that it negatively impacts the menstrual cycle. Impaired LH secretion due to weight loss can cause a shortening of the luteal phase.[14] Women with a BMI category underweight can also be at risk of experiencing dysmenorrhea, because a woman's body condition becomes weak so that it contributes to decreased resistance to pain.[19]

Menstrual cycles in women with more than normal body fat are caused by increased production of androstenedione, an androgen that acts as a precursor to reproductive hormones. Androgen is a hormone that will be converted into estrogen through the process of aromatization of granulosa cells and fat tissue with the help of the enzyme aromatase. Increased high estrogen levels cause negative feedback on GnRh secretion in the hypothalamus. FSH levels do not reach the peak due to high estrogen levels and follicular development will stop so ovulation does not occur. This situation results in the occurrence of oligomenorrhea or amenorrhea.[7] Body fat is also known to be associated with the hormone leptin which functions in regulating appetite, energy consumption, and the sympathetic nervous system. People who are overweight will experience resistance to leptin, where leptin levels cannot control fat tissue in the body. Uncontrolled fat will cause estrogen levels to rise.[18]

Women with a normal BMI and optimal nutritional intake will have normal body fat levels so that the hormone estrogen in the body is at normal levels. The hypothalamus will carry out its function properly in producing reproductive hormones, so that the menstrual cycle will run regularly.[15] A weight loss program of 5-10% of initial weight at a minimum of 4 weeks in women who are overweight can reduce hyperandrogenism, which is the excess levels of androgen hormones in a person's body. Program to increase body weight to achieve ideal and improve the quality and quantity of nutrients can improve the body's reproductive function in women with underweight.[3]

CONCLUSION

Based on the research that has been done, it can be concluded that there is a significant relationship between BMI and menstrual cycle disorders in Udayana University Faculty of Medicine students. Menstrual cycle disorders are more commonly experienced by research subjects in the category of underweight BMI (89.5%) and overweight (84.6%), while regular menstrual cycles are mostly experienced by respondents in the category of normal BMI (90.7%).

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